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MONTHLY AND ANNUAL PRECIPITATION AT MAZATLAN, SINALOA, MEXICO, FOR THE YEARS 1909, 1910, 1911, AND 1912.

[Data furnished by W. E. Alger, United States consul.]

	1909	1910	1911	1912	Average.
January	T.	T.	T.	0.18	0.04
February	0.00	0.00	1.77	0.33	0.52
March	0.00	0.00	0.00	T.	T.
April	0.00	T.	T.	0.00	T.
May	0.00	0.00	T.	T.	T.
June	0.07	0.40	0.52	4.26	1.31
July	5.52	8.57	8.76	1.11	5.99
August	9.28	4.61	6.10	3.19	5.80
September	1.92	5.03	2.18	7.04	4.04
October	T.	4.04	3.91	0.62	2.14
November	0.00	0.00	1.37	0.00	0.34
December	2.89	1.69	0.56	0.26	1.35
Annual	19.68	24.34	25.17	16.98	21.53

NOTE.—On account of the meager character of the data regarding rainfall distribution over the Pacific coast districts of Mexico, the above table should be of interest. Attention is at once drawn to the heavy rainfall of the summer months, and the marked dryness of the winter and spring periods, conditions directly opposing those prevailing along the Pacific coast of the United States. P. C. D.

TWO CLIMATIC CROSS-SECTIONS OF THE UNITED STATES.[1]

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Introduction.—Between the tabulated data on a page of some climatological report, and actually experiencing the climate itself and observing its effects, there is a difference as great as that between reading a description of a glacier and seeing or climbing over the glacier. A traveler who is something more than a sightseer, and who is interested in climatological "field work," can see, even through a car window, types of meteorological conditions and their effects which will give him a vivid impression of the larger facts of climate and of their control over man. Such field work is not instrumental. It may be termed a series of "climatic snapshots." The impressions thus gained are inevitably superficial. But, taken together, they constitute a sort of moving picture as much more vivid than the tabulated data of climate as the real glacier is more vivid than the printed account. The writer had the privilege of taking part in the recent Transcontinental Excursion of the American Geographical Society. This trip gave an excellent opportunity to see two climatic cross-sections of the United States. As the journey was made rapidly, the climatic contrasts were sharply emphasized, and the "snapshots" were very clear and instructive. Some of the impressions thus gained are briefly described here in the hope that readers who may not have had the good fortune to take such a trip may perhaps, in some slight way, share in the meteorological advantages of the journey.[2]

[1] Notes taken during the Transcontinental Excursion of the American Geographical Society of New York, Aug. 22–Oct. 18, 1912.

[2] The party left New York Aug. 22, by special train, and traveled via Albany, Chicago, Madison, Duluth, Yellowstone National Park, Spokane, Seattle, San Francisco, Salt Lake City, Denver, Santa Fe, and the Grand Canyon to Phoenix, Ariz. From Phoenix the return journey was via Kansas City, Memphis, Birmingham, Chattanooga, Asheville, and Washington to New York.

New York to Duluth.—The favorable distribution and amount of rainfall, and the general uniformity of weather types, of climate, and of agriculture over the northeastern section of the United States, bring fewer quick, sharp contrasts to the attention of the average traveler, who is accustomed to a humid climate, than he notes farther west and southwest, where decreasing rainfall, irrigation, dry farming, treelessness, and deserts are striking features of the landscape. There was, nevertheless, much of interest in the first 10 days of the transcontinental journey. A series of six low-pressure areas, moving rapidly across the northern portion of the United States, and of three anticyclones, controlled the weather. The journey was westward; therefore the succession of varying weather conditions was rapid. The "lows" brought their usual accompaniments of high temperatures in the southerly winds of their eastern quadrants, followed by showers or heavy rains and then clearing, cooler weather on the rear. Yet the regular sequence of these types was such that no real inconvenience or change of plan resulted from the rains, while the cool and clear anticyclonic days, with northeasterly and easterly winds, happened to be just the days which were spent sightseeing in the cities (Chicago, St. Paul, and Minneapolis). The muggy heat of the first cyclone was oppressive during the ascent of Mount Beacon, on the Hudson (Aug. 22), and the haze of the southerly winds interfered with the view. The ice houses along the Hudson brought a suggestion of winter cold into the hot hours of this first day, as did the guidebook's statement that "Poughkeepsie is the center of ice-boat sailing." The long trains of meat-laden refrigerator cars, bound for New York City, emphasized some of the economic consequences of our summer heat. The rains which followed interfered somewhat with the comfort of a morning motor excursion from Syracuse, but the brisk southerly winds of the next depression were very favorable for the view of Niagara Falls from the Canadian side, for they blew the spray away from that side, and the heavy warm southerly rains which followed fell while the party was on the train. By the time of a morning excursion, on the next day, there was only the evidence of what had happened in the swollen, muddy streams, the standing water in the fields, the bent and broken cornstalks, and the damaged fruit trees.

During the steamer trip from Toledo to Detroit the change from the warm, muggy southerly winds in front of the third cyclone to the cool, dry, gusty northwesterly winds in its rear was so sudden as to attract the attention of every member of the party. The showers from the fourth cyclone again fell during a night journey (Chicago to Madison). Economic climatology was illustrated at the Syracuse salt works, where natural evaporation is carried on under unfavorable conditions, owing to the large amount of cloudiness and the high relative humidity, although rain is kept off the evaporating basins by roofs. The contrast between these unfavorable conditions of evaporation in the damp, cloudy, and rainy East and those seen later near Salt Lake City, in the dry and clear West, was very striking.

Duluth, "the city of perfect summers," as it is called in some of the local advertising matter, greeted the party with heavy easterly rains on the morning of their arrival (Aug. 30), and again on the afternoon of the second day at that place (Aug. 31). The temporary clearing between these two rainy spells gave opportunity for a trip on flat cars through the open-pit iron mines at Hibbing, and for a steamboat trip in Duluth Harbor on a chilly, overcast morning, with northeast winds preceding the second rainy spell. This precipitation all came in connection with a considerable area of low pressure and generally stormy weather, covering the region west of the Lakes and extending up into western Canada. These rains, which had been quite general throughout the northwest for a week or more, had interfered with harvesting, and there were fears of a "tie-up" of grain-carrying vessels at Duluth in consequence. Duluth's shipping trade is, naturally, very closely dependent upon season and weather. The close of lake navigation, in November or early December, turns the transportation of freight to the railroads, or leads to a delay in shipments until the opening of navigation in spring (about Apr. 15). The iron-mining industry is also closely dependent upon weather conditions. The ore freezes readily at temperatures 10° or so below 32° F., and precautions must be taken not to have the ore on the cars long at very low temperatures.

It is thus obvious why the local iron interests, as well as those which handle grain and other agricultural produce, watch with care the local forecasts of minimum temperatures. The iron mines are operated through the winter, but more blasting is then necessary. The ore is quite commonly put into so-called stock piles, where it is kept for spring shipment by water. During the winter, while the ore boats are out of commission, their crews scatter to other occupations, or attend schools or colleges. The cold winters have their compensations. Duluth is far enough toward the northwest to have many clear, cold, calm days of the typical western Canada type, and to escape much of the stormy weather of the eastern sections. Ice-boating and ski-running are common winter sports. This northern latitude also puts the city on the northern side of the track of most passing cyclones. "Northeast storms" and "backing" winds are the rule. Hence the sequence of weather changes, the kind of precipitation, and the wind changes, are characteristically different from those at stations farther south.

Duluth to Yellowstone National Park.—Through the sparsely settled forests of northern Minnesota, and then—under conditions of increasing aridity, decreasing rainfall, more evaporation—among scattering trees, the train passed quickly westward to the eastern border of the treeless Great Plains. If one may trust an impression gained from the window of a rapidly moving train, it would seem as if this western Minnesota country must, owing to its favorable rainfall, have a splendid future for farming. About at the eastern boundary of North Dakota is found the mean annual isohyetal line of 20 inches, that critical limit which has been of such far-reaching importance in the settlement and development of the Great Plains. "East of it, success; west of it, failure," is a statement often made regarding the relation of this line to agriculture. Yet no fact is to-day of greater significance in the history of these great Northern States than the extraordinary success which has been attained in agriculture well to the west of this same line, by means of the scientific methods of soil preparation and of cultivation known collectively as dry farming. It would be convenient, and economically highly useful, if the limit of agriculture could be definitely stated in exact terms of inches of mean annual rainfall. This is impossible. There are too many other factors concerned in the relation. The famous Red River Valley with its fertile soil, and its immense "bonanza" wheat farms, was crossed on a beautiful Sunday morning in early September (Sept. 1). Here the mean annual rainfall is a little over 20 inches, and the mean seasonal rainfall is less than 15 inches.

The rains of the past few days had turned the rich black soil into such thick mud that motor trips, except on the paved streets of Fargo, were impossible. The presence of many "farm hands" in Fargo emphasized the part which the unfavorable weather had played in delaying harvesting. In the great seasonal migration, from Texas to Canada, following the ripened crops, a part of the army of harvest hands had here halted temporarily in the great North Dakota wheat country.

Farther west the decreasing rainfall was clearly evidenced by the increase in the number of cattle as the farming area became more and more restricted. Windbreaks, carefully planted and tended, showed the need of protection against the high winds which sweep over these great northern plains, and emphasized their natural treelessness, except along the river valleys. The necessity of a proper selection of the trees which will grow under the unfavorable climatic environment of this region was emphasized by the sign on a nursery in the valley of the Cheyenne River: "Northwestern Nursery Co. The best trees for the prairies." Snow fences, often double, along the railroad indicated the climatic handicap of drifting snow in the winter blizzards. In many places the Northern Pacific Railroad is replacing the snow fences with trees, and while this is succeeding fairly well in eastern sections, it becomes more and more difficult in the West. Windmills gave clear proof of the necessity of pumping water. Thus the westward journey across the Great Plains gave a vivid picture of the importance of the rainfall and wind control. At Bismarck, N. Dak., some irrigation was noticed, but not yet on a large scale. Dry farming has been so successful throughout an extended area in the Far West, in recent years of heavy precipitation, that the need of irrigation in the long run has not yet been realized by hundreds of farmers who have prospered without it. At Medora, in the "Bad Lands" of western North Dakota, the aridity was indicated by the presence of the sagebrush and of scattering cactus; while the strong winds, carrying clouds of dust, and the marked diurnal variation of temperature under a clear, anticyclonic sky, with a wonderfully clear, cool, calm night added to the typical summer weather characteristics of our western "semiarid" country. Trees growing on the northern, rather than on the southern slopes, probably indicate the unfavorable effect of the intense heat on the latter, and possibly also of the greater amount of soil movement. A dry climate, scanty vegetation, and the quick removal of the sands and clays by the rivulets and streams produced by the occasional rains, combine to produce this curious Bad Land topography. Beautifully green and fertile are the river valleys through which the Northern Pacific Railroad crosses Montana, with their crops of cereals, alfalfa, vegetables and fruit, and with their farmhouses nestling down among the trees. But back of these oases there are the sagebrush and the bunch grass and the aridity of the semidesert, with their scattered cattle and sheep, while many dry farmers are trying their luck on the debatable ground between the valleys and the desert.

Yellowstone National Park.—Six days, full of interest, were spent in the Yellowstone National Park (Sept. 3–8). Here, as much as anywhere else on the excursion, "weather" was obvious and compelled attention, not because it was unseasonable or unusual, but because it was different—normally and naturally different—by reason of altitude, and latitude, and longitude, from the weather types of the East and of the Plains. A splendid variety of weather did that week in the Park bring: Thunderstorms; chilly days, when the "winter overcoats and heavy underwear" recommended in the Daily Bulletin of the Excursion were very welcome; cold nights, with frost and thin skims of ice on standing water;[1] snow squalls; bright, clear, crisp mornings and evenings, with warm noons (diurnal ranges 25°–30°) when ulsters were a burden, even on the drives; nocturnal radiation fogs;[2] and a diurnal variation in wind velocity so marked that driving through the forests was a relief after being in the open, and that it was dangerous to go near the edge of the cliffs at the Canyon of the Yellowstone. Thus was this interesting week made up, under varying cyclonic and anticyclonic controls—a week of typical "mountain and plateau" weather in the month of September. Many of the types recalled New England October or November weather. So heavy was the frost one night that when it melted on the tops of the stages under the morning's sunshine there was a veritable little shower of raindrops. Dust there was none until the last day, thanks to the recent rains. Official Weather Bureau records of rainfall are maintained at Mammoth Hot Springs (mean annual, 18.80 inches), but it needs only a hasty glance at the vegetation, while driving, to show that there are very considerable differences in the rainfall in different portions of the park, as there must also be in snowfall. Sagebrush and bunch grass indicate semiaridity in places, while the higher slopes and summits have heavier precipitation. One fact of meteorological and of scenic interest impressed itself upon the mind of the writer. The "steam" from hot springs and geysers must be much greater in amount in cold and damp weather. Hence it is reasonable to infer that hot, dry days ought to give the clearest views of these phenomena.

Yellowstone National Park to Seattle.—From the Park, northwest and west, on the Northern Pacific Railroad, through green and fertile valleys, with crops of wheat, alfalfa, oats, potatoes, and other produce; with irrigation here and dry farming there, the journey was continued toward the Pacific coast. The traveler must beware lest he carry away a mistaken impression regarding the availability of this section for agriculture. The railroad naturally follows the valleys, which are damp, irrigable, and well settled, and have fairly abundant tree growth. But back of the obvious valleys there are the less obvious bench lands, where dry farming is now being practiced, and where the trees are struggling up the small side canyons and gullies. And then back still farther there come the still less obvious stretches of semiarid sagebrush, treeless country, non-irrigable, not adapted to dry farming, and suitable only for stock. Probably about one-fourth to one-third of Montana is actually available for farming.

Dry farming is farming without irrigation in a country where the rainfall is too small for successful agriculture unless this rainfall is cared for and conserved in a special and peculiar way. The problem is essentially climatic. It becomes, also, a problem of soil preparation, and of the proper selection of seeds and crops. But, given enough and well-distributed rainfall, there would be no dry-farming problem. Breaking up the hard subsoil so as to give the rainwater a chance to penetrate; keeping a thin, loose mulch on the surface to check evaporation; spring plowing,[3] so that the stubble may hold the winter snows; cultivation immediately after the plowing; a selection of crops which will ripen quickly, will come

[1] A killing frost had been reported at Mammoth Hot Springs, Aug. 31.
[2] Supplied, in part, near the hot springs and geysers, by "steam."
[3] This becomes fall plowing in districts of winter rains. Fall-sown cereals take nearly a year to ripen.

nearest to maturity during the rain season, and which, being drought resisting, can wait until rains come[1]—these are some of the simple and essential methods in dry farming. Soil properly treated by these methods, under favorable conditions, is damp down to 6 to 8 feet, or even 10 to 12 feet.

There are other problems for this region. There is the question of the permanence of dry farming. A steady succession of crops dries up the soil in a few years, whence arises the need of manuring and of cropping in alternate years. There is also the desirability of tree planting, and thus of making the farms more homelike and attractive. While there is in western Montana to-day two or three times as much dry farming as of irrigated farming, the dry farming is all of such recent date that there are a good many questions concerning it which time alone can answer One thing is sure: There is a pretty definite limit to the amount of land which can be irrigated. Water will not be available for any more. Land which can be irrigated is naturally worth a good deal more than that which can not. Thus, in this western Montana country, irrigated lands sell for from two to four times as much as the best "dry" lands. Dry farms require a large area. Hence modern agricultural machinery is a necessity, and its use is greatly facilitated by the absence of irrigating ditches. The best advice which can be given to any farmer in this semiarid country is: "Wherever you can irrigate, irrigate; if you can not irrigate, dry farm." As to the mean annual rainfall limits for dry farming in western Montana, it is difficult to give an exact figure. Perhaps 12 to 13 inches would be a fair estimate, but topography, winds, slope, soil, and other factors are important controls and warn us against attempting too close an estimate. Where the soil is rich, and the farmers are skilled in dry-farming methods, as is the case in eastern Washington, for example, with the German-Russians, dry farming has succeeded with less than 15 inches of rainfall. An excellent statement of the general economic and climatic status of dry farming has been given by Prof. W. M. Davis in the following words:

> It has not yet been tried through a long enough period to make sure that it is more than a precarious occupation, sometimes profitable, occasionally disastrous; it is invited more by the low price of arid lands than by the certainty of crops; it can be best practiced by those who have enough hope or capital to survive one or two years of failure with two or three of success.

Across this inspiring Montana country—inspiring because of its ruggedness and the splendid energy of its people—over the "Great Divide"; through Butte with its clouds of smoke and gigantic mining operations, and Missoula with its irrigated fruit orchards, the train hastened on its westward journey in wonderfully clear anticyclonic weather, across the northern tip of Idaho into Washington, whose home name, the "Evergreen State," clearly indicates one of the essential results of its climate.

In eastern Washington, on the fertile soil of the decomposed lavas, Spokane, with a mean annual rainfall of about 18 inches, and a rainfall in April, May, and June of less than 5 inches, is the center of a district of wonderful agricultural prosperity. From Almira, somewhat west of Spokane, an excursion was made by motors through a dry-farming district where remarkable success has recently been attained with wheat in a district with considerably under 20 inches of rainfall a year. There is no water available for irrigation over these wheat fields. It must be dry farming or cattle. On a glorious day, with clear skies, except for the soft haze which added a charm to the distant view, and with a rapid diurnal warming, the party had an opportunity to witness harvesting by means of the latest horseless combined reaper and harvester ("caterpillar"), as well as by means of one of the older machines drawn by 24 horses. Here, a few feet under the surface, the soil was tested and found damp, while above it there was thick dust. Here were seen acres and acres sown to wheat, yielding 20 to 25 bushels an acre, and giving (at present) good crops about four years out of five. Here the wheat is left piled up on the fields, without fear of rain. Here, around the farmhouses, trees have been planted, and windmills pump water for domestic use and for farmyard irrigation. Here, in the Grand Coulee, at the Baldwin Ranch, the excursion party enjoyed true western hospitality so generous and so whole-hearted that the day will live always in the memory of those who were privileged to be there. At Coulee City itself irrigation by pumping ground water has brought phenomenal success in fruit raising. What was three years ago a sagebrush desert is to-day a thriving peach orchard.

Dry farming has been very successful over much of the West, but there is a limit to it. The journey southward on the treeless lava plateau of Washington, across the Columbia River at Pasco, and then westward and northwestward up the valley of the Yakima River, brought the train into a district, in the lee of the Cascade Mountains, where the annual rainfall varies between 7 and 13 inches, according to topography and elevation. It is here that man has turned the desert into one continuous garden. Here the wonderful orchards of apple, peach, and pear trees, the fields of hops and alfalfa, and the vineyards, reaching for miles and miles in every direction, make the traveler realize that the glowing accounts which have been printed of this region are not so greatly exaggerated after all. Up on the summits and upper slopes of the Cascades there is a rainfall 10 or 15 times as great as that in the valleys at the eastern base—a rainfall resulting from the presence of the mountains in the path of the rain-bringing westerly winds. It is this water which has been collected for the use of man in the Yakima irrigation projects. When completed, these projects are designed to supply water for 500,000 acres, and it is estimated that there will be enough water to irrigate all the arable land in the valley. Irrigation is but an expression of man's dissatisfaction with the amount or distribution of the local rainfall. At North Yakima man has expressed his dissatisfaction most emphatically by planning these great irrigation works which have revolutionized the whole settlement and use of that particular section. The interest of the climatologist in this Yakima country is not so much in the number of carloads of fruit which are sent out daily, or in the value of the land, or in the size of the apples, pears, and peaches. His interest is rather in the relation of the dry, leeward "rain-shadow" valleys to the well-watered mountain summits. By reason of their altitude and location, these mountain summits receive the heavy precipitation which largely makes up for the deficiency of rainfall in some of the lower valleys to leeward. There is here an interesting example of the compensation which is sometimes seen so clearly in climatology. Very bright is the future of the Yakima Valley. Canning and evaporating plants will soon be built, and where there is now terrible waste of fruit not in condition to ship, there will soon be a complete utilization of the crop.

[1] The cue to this selection comes from the native grasses, which grow mostly in spring and which can "wait" for moisture.

From North Yakima, past the orchards and fertile fields of Ellensburg, and then across the Cascade Mountains, the journey gave clear views of the treelessness of the lower lands on the east, except where windbreaks and orchards have been planted under irrigation; of the interesting overlapping of the forests from the rainy, western slopes into the higher portions of the eastern valleys; and then of the densely forested western slopes, with their waterfalls and water power, down which the train descended on its way to Seattle.

The Pacific coast—Seattle to San Francisco.—Nine rainless and mostly cloudless days, ideal for traveling and for sightseeing, were spent on the Pacific coast. Very striking was the contrast between the cool, tonic air of the Yellowstone National Park, closely followed by the hot and dry air of the dry-farming country around Almira, and then by the damper and more muggy marine climate of Seattle. There are impressions of Seattle's parks with their beautiful flowers, and grass and shrubbery, visited on a warm anticyclonic day with northeast (offshore) winds and a hazy atmosphere;[1] of the steamer trip to Tacoma (Sept. 14), with strong easterly winds on steep anticyclonic offshore gradients; of the "unusually hot day for Tacoma," as described by the reception committee there; and the striking illustration of the lumber industry seen in the huge Douglas fir, over 9 feet in diameter, sawed up for the benefit of the party at a Tacoma lumber mill. There was regret that the haze prevented good views of Mount Rainier. Most of the excursion party would probably agree with the sentiment, painted in large letters on a Tacoma signboard: "The Puget Sound Country—Land of Perfect Summers," and would, even after one visit, think Portland well named the "rose city." A trip to The Dalles of the Columbia River and their famous non-irrigated fruit orchards gave opportunity for contrast with the irrigated district at North Yakima. The strong down-valley wind, on steep anticyclonic gradients, was thick with blowing sand, and clearly showed the need of the fences which have been built across the dunes to keep them from burying the railroad tracks. The change in the character of the vegetation as one journeys from The Dalles down the river to Portland is an excellent "car-window" observation of the increase of rainfall, which just about trebles between The Dalles and Portland (15 to 45 inches).

At Medford, in the Rogue River Valley of southern Oregon, there is another remarkable fruit district. The mean annual rainfall is not far from 30 inches, and the fruit growers differ in their views as to the advantages of irrigation. Some irrigate; others do not. The natural vegetation of the district is sparse and economically worthless, but fruit trees (chiefly apples and pears) and alfalfa are replacing the so-called "desert," and Medford is now the center of a properous and contented community. So abundant is the fruit crop that weeds are sometimes allowed to grow among the trees to keep them from bearing too heavily. The campaign against frost, which is the most serious climatic obstacle to fruit growing, is in excellent hands. Dr. P. J. O'Gara has charge of the local "special" Weather Bureau station at Medford, and has been taking an active part in "frost fighting," studying local frost conditions, making frost forecasts, and experimenting with the most effective methods of protection. "Smudging" is here done with crude oil, and the orchards are all provided with oil tanks, filled and ready for use. A motor trip from Medford to Crater Lake, in ideal weather conditions, gave a good sample of the strong diurnal ranges of temperature characteristic of mountain climates, and of their crisp, fresh air of early morning and late afternoon and night. At Crater Lake itself a few patches of last year's snow were still to be seen, as well as freshly-fallen snow of recent date.

South of Medford the train passed through orchards and vineyards, with a climatic industry well illustrated in the sun drying of peaches; across the Siskiyou Mountains, with their cool air and magnificent views, and then (by night) down the western side of the valley of California to San Francisco. Wind-blown trees clearly showed the prevailing up-valley winds (southerly). After the well-watered and forested shores of Puget Sound, the absence of tree growth around San Francisco Bay was striking. But the Californians are sure in their estimate of their climatic blessings, as evidenced by the sign: "Crops without irrigation. Ideal climate. Inspiring scenery in Napa County." San Francisco itself was uncomfortably warm on September 19, with a maximum temperature of 80° and light northerly winds.[1]

An excursion to Mount Tamalpais (Sept. 20) gave a splendid opportunity to see the famous fogs of San Francisco Bay, which have been so thoroughly studied and so well photographed by Prof. A. G. McAdie. Even the hurried observations made by a traveler showed the "sea of fog" over the ocean; the fog rolling over the tops of the coast hills and dissolving on the lee side; the west wind bringing in the fog through the Golden Gate, into the bay, where it gradually dissolved; the "spilling over" of the fog across the coast mountains where there were gaps, while elsewhere the range made a sharp dividing line; and the "fog billows," so well described by Prof. McAdie. The chill of the cool wind from the ocean was keenly felt, and the need of overcoats emphasized one well-known feature of San Francisco climate (maximum temperature Sept. 20, 68°). Another cloudless day, at San Francisco and Berkeley (Sept. 21) again brought the fog over the ocean; the low temperatures with the westerly wind; the evident inshore transportation of fog particles and dust and smoke from San Francisco across the bay, and the characteristic cool late afternoon and evening.

San Francisco to Denver.—Early on the morning of September 22, a splendid type of anticyclonic weather, the special train of the American Geographical Society began to ascend the western slopes of the Sierra Nevada Mountains on the eastward journey from San Francisco to Salt Lake City. The vineyards, the orchards, and the orange groves; and then the forests—too often recklessly cut away—of the higher slopes bore witness to the fact of a sufficient and well-distributed water supply.[2] We need no meteorological tables to assure us that these mountains are admirably situated to give us an example of the increase of rainfall with altitude. If we desire the numerical proof, we have it in the records of mean annual rainfall between Sacramento and Summit. Between these two stations there is an increase of rainfall of about 0.4 inch for every 36 feet of elevation. The rate of increase is greatest at about 1,000 meters, and becomes negative above 2,000 meters. The mean annual rainfall at Sacramento is 19.40 inches; at Summit (7,017 feet) it is 48.07 inches.

The higher elevations have very heavy snowfall. At Summit the average annual fall of snow is 36 feet (433

[1] Maximum temperature 76°; minimum, 62°; Sept. 13.

[1] On this same day Fresno had a maximum of 98°; Los Angeles of 100°; Sacramento of 94°. It was thus distinctly a warm spell over this general region.

[2] The traveler from the east, on reaching Colfax, is greeted by the sign at the railroad station, "You are now in the rich and fertile Sacramento Valley."

inches). Twice in 33 years the amount has reached 65 feet (775 inches). The heavy snowfall has necessitated the construction of about 40 miles of snowsheds over the tracks of the Southern Pacific Railroad, and to the establishment of an elaborate system of watchmen and of "fire trains" to keep these sheds from being destroyed by fire. From Signal Peak nearly all of the snowsheds can be seen by the watchmen, who are always on guard there, and at their summons the "fire trains," consisting of tank cars filled with water, kept ready day and night, are run at high speed to the scene of the fire. These fires, it may be noted, are not usually due to the locomotives. The snowsheds, and these precautions against fire, as well as the snowplows, involve a heavy expense on the part of the railroads—a splendid illustration of a climatic control over railroad operation.

Traveling through these many miles of snowsheds is far from agreeable. The view is greatly obstructed, and the smoke from the oil-burning locomotives makes the air unpleasant to breathe. Yet these very discomforts only serve to emphasize the climatic lesson which the sheds teach—the lesson of heavy snowfall, on the upper slopes of a high mountain range, near the ocean, in the path of the prevailing westerly winds. Truly well named were the Nevada mountains.

From the crest of the Sierra Nevada the descent into Nevada is rapid. Similarly, the change in rainfall is rapid. The traveler can not fail to notice that the snowsheds extend a much shorter distance east of the crest of the mountains than to the west (windward). He therefore infers at once that the amount of snowfall decreases rapidly on the eastern (leeward) side of the summits. The green slopes and forests of the west are replaced by the sagebrush and allied forms of vegetation on the east. From a rainfall of 50 inches at Summit we descend with startling suddenness into the Nevada desert, with its alkali flats, its dust, and its less than 5 inches of rainfall, but also with its green oases of irrigation with their trees and cattle. Two days in and about Salt Lake City (Sept. 23–24) gave opportunity to see what has been accomplished in the home and center of modern irrigation undertaking in the United States.

Utah must always have a very peculiar interest for any traveler who is in search of climatological facts, for here is Great Salt Lake, with the inevitable reminder of its great ancestor, Lake Bonneville, and here was the beginning of modern irrigation in this country. Salt Lake City, Ogden, and Provo are all irrigated oases, but dry farming is also practiced to some extent, as, e. g., between Salt Lake City and Provo, where fruit, sugar beets, alfalfa, and vegetables are the chief crops under a mean annual rainfall of about 14 inches. Two of the days (Sept. 24–25), with fresh and cool northwest wind and fair skies, were a fine type of autumn anticyclonic weather over the Great Basin, "light overcoat weather," if we use the convenient overcoat scale for temperature. "Protect 36-hour shipments against 40° in all directions" was the Shippers' Forecast on the Salt Lake City map for September 23. On the map for September 24 it was stated:

> The northwestern high pressure is spreading eastward and southward, and causing cooler weather practically everywhere in the Rocky Mountain, Great Basin, and Pacific States; and in Utah this fair, cool weather is expected to continue for at least 36 hours, with heavy frost and freezing temperatures to-night in exposed localities.

The local salt works on the shores of Great Salt Lake furnished a good illustration of the application of climatology to human industry. Here almost ideal conditions of natural evaporation, under the bright sunshine, give quick drying. The less favorable climatic conditions for evaporation at the salt works at Syracuse, N. Y., were naturally recalled.

The fruit orchards and green fields and shaded streets of Grand Junction, Colo., stood out in sharp contrast against the naked cliffs in the background. Gray and bare and useless for agriculture is all that district except where it is irrigated.

Two of the Government irrigation projects are in this region. Cattle and sheep manage to find sustenance where fruit and trees and cereals can not grow, and in live stock western Colorado has found much profit. Water power in increasing amounts is being furnished by the streams which descend from the rainier mountains into the drier valleys. Fine clear days, with crisp mornings and evenings and warm noons, marked the trip through this district. That the nocturnal minima had fallen below 32° was abundantly proved by the frozen crops. A glorious day (Sept. 27) for the trip across the Continental Divide (Hagerman Pass) was favorable for observations of "car-window" climatology. The increasing tree growth with increasing altitude pointed to increasing rainfall. Patches of snow on north slopes emphasized the low temperatures and the importance of exposure. The long icicles on the water tanks and the ice coating on standing water gave non-instrumental records of temperatures below freezing, lasting for some hours. Wind-blown trees indicated prevailing westerly winds. The diurnal variation in wind velocity was a marked and natural consequence of the weather type and of the topography. Snowsheds again called attention to the handicap of deep snows. South Park, with its level, green fields, and its surrounding snow-covered mountains attracted attention to the importance of Colorado's natural parks as grazing areas, and as present and future health and pleasure resorts.

One of the picture post cards commonly sold in Denver represents a map of the United States, all in dark shading with the exception of one bright yellow, sunny spot around Denver. Underneath are the words: "See that spot? That's it." To the great regret of the reception committee of Denver citizens, the day in that city (Sept. 28) was chilly, cloudy, and unsettled, with cold northerly winds, followed by rain in the evening. It was distinctly "winter-overcoat" weather.[1] This cloudy and rainy spell came in the southern and southwestern quadrants of a well-developed anticyclone, and gave rain the next morning during the trip through the Royal Gorge of the Arkansas, the day continuing cool and overcast. In eastern Colorado the irrigated fruit orchards and fields of Canyon City and of Pueblo, and the green and fertile belt in the valley of the Arkansas, were good types of the irrigation which extends along the eastern base of the Rocky Mountains. The importance of the sugar-beet industry was evident in the sugar-beet factories and in the freight trains all loaded with the beets. It was easy to see why disputes have arisen between Kansas and Colorado regarding water rights in the Arkansas River. Colorado makes great demands upon the river before Kansas ever has an opportunity to take water from it.

New Mexico and Arizona: Raton to Phœnix.—"Through a semiarid and monotonous country, which, however, makes some response to irrigation." Thus Baedeker's "United States" describes the railroad journey through

[1] Maximum temperature 48°.

New Mexico. Semiarid, yes; but monotonous, never! Those vast stretches with their yucca, and cactus, and artemisia, and bunch grass; with their foothill covering of piñon and dwarf cedar; with their brown, gray, and red mesas and rolling hills and mountains; with their adobe houses and scattering settlements and struggling trees wherever there is water; with their historical associations of the past in their cliff-dwelling and ancient pueblos, and their promise for the future where water is being supplied; with their baking sunshine and fitful rains; their varying lights and shadows; the afternoon clouds on their mountains; their wonderful sunrises and sunsets; the crispness and freshness of early morning and late afternoon and night; the inspiration that comes from their vastness and their loneliness! How can even the casual traveler who crosses these great States on the fast trains of the Santa Fe or of the Southern Pacific find the journey monotonous? Surely, the stamp of aridity is everywhere. It has made its mark on nature and on man, and on all the activities of man. But a desert is no more monotonous than are green fields, or vast forests, or the waving wheat of our prairies. Grim, indeed, are these plateaus and mountains. Vast they are, but monotonous, never. The desert has a charm peculiarly its own, and happy are those who feel it. "Arizona: the Sunset Land." Thus has it been called, and truly does it deserve its name. Wonderful has been the effect of this southwestern climate upon the unfortunate "lungers" who have here found health and strength.

An excursion from Santa Fe to a neighboring pueblo inevitably brought up the problem of the former larger population of this region, and the possible reasons for the abandonment of the ancient dwellings. Climatic "change" seems to offer the simplest solution of this problem. But is it the only one? The trip by wagon from Adamana to the Petrified Forest, chiefly of geological interest, nevertheless gave the excursion party, on the hot and dusty drive, a fine example of the strong diurnal variation of temperature characteristic of our Southwest. No finer display of cumulus and cumulo-nimbus cloud development could have been desired than was witnessed during that day—the typical cloud processes of our arid region. The deep sand "washes" on both sides of a typical stream channel, which forced most of the party to walk in order that the wagons could be drawn across, drew attention to the floods of these desert streams in "cloudbursts," chiefly in July and August. Wells have been dug here and there along the river bottoms, and water has been found in sufficient quantity for domestic purposes and for the use of cattle and sheep. Arid and unpromising this country looks as pasture land, with its rabbit brush and other characteristic vegetation. But it is, and will be, a stock region of some importance. It can never be a farming country. There is enough natural pasturage for a limited number of cattle, but this number must be limited; otherwise overstocking and deaths by starvation will result.

At "Sunshine" station—well named, indeed—there was standing a long train of tank cars full of water which had been brought 50 miles down the line. From the bottom of the tanks the water flowed into a sluiceway, and thence into a large underground tank, from which it was pumped by means of an engine to an elevated tank, above the track, for locomotive purposes. Thus man has to plan and to provide what nature has not given him. Who can adequately describe the glorious wonders of the Grand Canyon—its grandeur, its coloring, its impressiveness? Surely, much of this glory must be attributed to atmospheric conditions and phenomena—to the dryness and the clearness of the air, far from city smoke and soot; to the wonderful cloud effects; the changing lights and shadows; the distant showers; the rainbows; the sunrise and sunset colors, and, in winter, the snows. The guidebook tells us that we ought to visit the canyon—

> in the early spring, before the hot season and the rains of July and August arrive. Although in the winter months, preferably December-January, while the keen, thin, cold air makes the driving and horseback excursions less agreeable, the effects given by cloud and snow under the brilliant skies are varied and striking.

A very real appreciation of meteorological conditions is contained in these sentences, but no traveler should be deterred from visiting the Grand Canyon at any season. There is never a time when the varying play of the weather elements does not give beauty and variety in that wonderful region, and never a time when these elements combine to give any long-continued serious discomfort.

Phoenix, Ariz., was the southwestern terminus of the transcontinental excursion; Phoenix, surrounded by those great stretches of Arizona desert, with their giant cactus and their mesquite shrubs, and itself green and smiling and very prosperous in the midst of its palm trees, its wheat, barley, and alfalfa fields, and its wonderful crops of oranges, peaches, olives, grapefruit, figs, pears, plums, dates, melons, and sugar beets. Very striking is the sight of the giant cactus—the lingering representative of the former desert—standing in the newly irrigated fields, its base hidden in the damp green alfalfa: the old and the new.

The visit to Phoenix, Ariz., and an excursion to the Roosevelt Dam emphasized some important facts in Arizona climatology. Southwestern Arizona is extremely arid. Yuma, for example, has an average annual rainfall of only slightly over 3 inches. There is thus far too little water for agriculture in any form without irrigation. But Arizona is not all as near the sea level as is its southwestern corner; it is fortunate in having its mountains and its plateaus. Over these forested mountains and plateaus fall the rain and the snow which is of such vital importance in irrigation. If Arizona were all lowland it would be a very hopelessly dry region. The rainfall varies almost directly with the altitude. From a mean of less than 5 inches in the southwest, the amounts increase to about 8 inches at 1,000–2,000 feet; to about 12 inches at 2,000–4,000 feet; to over 14 inches at 4,000–6,000 feet; and to 16 to 20 inches at altitudes of over 6,000 feet. It is thus over the higher country of Arizona that we find the so-called "islands"—they might better be called "lakes"—of heavier rainfall seen on the detailed rainfall maps. From these "lakes" flow rivers. These rivers, when dammed, as in the case of the Salt River by the Roosevelt Dam, supply water enough to irrigate thousands of acres.

The trip from Phoenix, in the Salt River Valley, up into the mountains to the Roosevelt Dam, was made on October 4. While two rather heavy showers were encountered before the lower, level country was left behind, it was clear from observation of the clouds that the mountains were receiving far more rainfall than the valley. At the dam, 24 hours of heavy rain prevented the party from returning to Phoenix until a day later than had been planned, the journey back being too dangerous, if not impossible, for motors. This long, dreary day at the Roosevelt Dam taught an important climatic lesson. It emphasized most strikingly the value of Arizona's mountains in supplying the water which the State so greatly

needs. The value of this one spell of rainy weather to the farmers and fruit growers of the Salt River Valley was surely to be reckoned in thousands of dollars. Phoenix receives, on the average, less than 8 inches of rainfall annually. Over the watershed behind the Roosevelt Dam about 12 inches fall. These 4 inches seem relatively insignificant. But it is just these 4 inches, resulting from the difference of altitude, which, when carefully collected and stored and wisely distributed, make the glory of the Salt River Valley, of which Arizona is so justly proud.

For a week, from September 30, the excursion party was in the "deserts" of New Mexico and Arizona. Rain fell on five of these days. At Santa Fe, on the afternoon of September 30, there was a shower between 3 and 4 p. m., following the growth of massive cumulus, and later of cumulo-nimbus clouds over the mountains during the morning hours. On the afternoon of October 1, while an excursion was being made from Sunshine Station to Crater Butte, there was again a wonderful development of cumulo-nimbus clouds which resulted in many showers of short duration—those fitful, uncertain showers which are so characteristic of the more arid portions of our country, and which are followed by such a wonderfully refreshing smell of wet soil. October 2, at the Grand Canyon, brought a heavy thunderstorm between 7 and 8 a. m. On October 3, also at the Grand Canyon, a thunderstorm occurred in the evening. On October 4 there were showers in the early morning, and during the motor ride to the Roosevelt Dam showers interfered with the outdoor luncheon generously provided by the citizens of Phoenix. The heavy rains of October 5 were referred to in the preceding paragraph. All these rains came as a surprise to the party. To experience a heavy thundershower at Sunshine seemed a contradiction of nature. Being in a "desert" region, no rain was expected. In fact, these New Mexico and Arizona rains were almost the only rains which were met with in the long trip of eight weeks. They were, therefore, of singular interest.

To the excursion party the best definition of a desert seemed to be this: A place where it rains when you are there, and where it is dry the rest of the time. "Prepare for dust" was the advice given to the party when it started on the motor ride to the Roosevelt Dam, but raincoats, not dusters, were the real need.

Taken in the large, there are two rainy seasons over this New Mexico and Arizona country. One of these—the most marked—comes in July and August, extending in places into early September. These rains are essentially local, mountain, or convectional rains. The other rainy season, which is less marked, comes in the colder months and results from the passage of the usual cyclonic storms of the winter. An examination of the daily weather maps shows that the showers of September 30 and of October 1 were local, and not part of any general cyclonic disturbance. On October 2 there was a considerable area of unsettled weather in the far Southwest, but no general rains. The thunderstorm of October 3 was again purely local. On October 4 a trough of low pressure extended from north of North Dakota southwest to the Pacific coast, with a good deal of cloudiness and scattered thunderstorms. In the 24 hours ending at 8 a. m. October 5 Santa Fe received 0.56 inch; Flagstaff, 1.78 inches; Yuma, 0.04 inch; and Phoenix, 0.14 inch. The all-day rain at the Roosevelt Dam on October 5 was part of a general storm which had developed from the unsettled conditions of October 4, and at 8 a. m., covered the Plains States, and the central Rocky Mountain and Plateau regions, accompanied by widespread rains and snows. The disturbance was central over Utah and Colorado. During the 24 hours ending at 8 a. m., October 6, Santa Fe had received 0.04 inch; Flagstaff, 0.34 inch; and Phoenix 0.06 inch. The rainfall at the Roosevelt Dam, not reported on the weather map, was much heavier than that at Phoenix. Thus the rains which were experienced in New Mexico and Arizona afforded an excellent illustration, as we might say, of the precipitation conditions of the two rainy seasons in this "desert" region—the local showers of summer, and the general rains of the colder months. The excursion party of the American Geographical Society was singularly fortunate in having this interesting experience in the rainy desert.

To a superficial observer of these deserts it seems as if irrigation must completely and successfully solve man's agricultural problems. But here, as everywhere, the apparent solution of one problem gives rise to other new and unexpected problems. Nowhere is there lack of struggle. The rise of the ground-water level as the result of irrigation causes a deposit of alkaline salts on the surface. Thus the irrigated desert has in places become an alkaline desert. So the ground-water level must be kept down by pumping, and the pumped water, in order that the excess of salts may be neutralized, must be mixed with fresh water before it can be used for irrigation. The irrigation canals are bordered by weeds. From these, seeds drop into the water and are distributed over the fields and through the orchards, giving rise to another new problem. Thus the eternal struggle of man against nature goes on in varying phases.

Phoenix to New York.—A series of climatic "snapshots," taken in quick succession on the run from Phoenix to Memphis by way of Kansas City, summarized much that had been previously observed in a more leisurely way. From the semiarid Southwest to the humid East, from the land of sunshine and cactus and of irrigation to the land of cotton and forests, mighty rivers, and abundant rainfall, what a change! In recalling that flying trip one thinks of the snow and the cold at Flagstaff (Oct. 7); the evidence of recent heavy rains in the muddy streams and the pools of water standing on the desert; the curious dense fog near Adamana (Ariz.), in the damp, cool morning air; the stock pens and loaded cattle cars; the irrigation in the Rio Grande Valley; the last wonderful desert sunset in New Mexico, which drew every member of the party to the observation platforms to watch the brilliant colors in silence. Then came, in quick succession, the irrigation and good crops in the Arkansas Valley in western Kansas and the dry farming back from the river, with the scattered farmhouses and windmills and the very few trees; the sense of infinite distance on the Great Plains, but the lack of the romantic charm of the Southwest; the crossing of the historically critical one-hundredth meridian; the gradual but perfectly evident change from treelessness, dry farming, and many windmills to bigger fields, better crops of corn, sorghum, and winter wheat, larger, more frequent and more effective wind-breaks, more native trees, fewer windmills, continuous farms, more towns, more people, greater prosperity. Thus Kansas City was reached in the late afternoon of October 8.

The rest of the story is soon told. On the journey from Kansas City to Memphis the cotton fields, abundant tree growth, lumber mills, woodworking industries, and an ice plant gave clear indications of a warm climate and of abundant rains. A muggy morning in Memphis contrasted strongly with the dry, invigorating air of Arizona. A trip down the Mississippi to Helena (Ark.) on a beautiful October afternoon gave glimpses of cotton bales,

broken levees, and of Government works, "snagboats" and dredgers at various points, perhaps suggesting to more than one of the party that the place to control the floods is on the headwaters of the tributaries, not on the lower portion of the Mississippi itself. Cotton picking was seen on the journey across northern Mississippi and western Alabama, to Birmingham, on a hot, muggy day (Oct. 10), with southerly winds. Going north up the valley to Chattanooga the gradual decrease in cotton acreage was noticeable. A few hours in Asheville served to show the natural topographic and scenic advantages of that well-known health resort—far enough south to escape the deep snows, severe cold, and gray skies of the northern winters; far enough north, and high enough above sea level, to furnish a comfortable summer resort for those from the south. Singularly favored thus is Asheville, with the soft outlines of its forested mountains, its clean, pure air, its sunshine and its midway location between the extremes of north and south. Down the eastern slopes of the Appalachians and out through the Piedmont the journey continued, the forests, about equally heavy on both western and eastern slopes, showing that these mountains are not an effective climatic divide. The last day on the special train (Oct. 12) took the party through the beautiful orchards and farms of the Piedmont region, Virginia, and ended at Washington. On October 18, in New York, the party disbanded, on schedule time, exactly as planned many weeks before.

The members of the transcontinental excursion party, each in his own way, profited immensely from the trip. Geological, physiographical, botanical, ethnological, and other studies were made by its members, as their own interests or opportunities prompted them. But in the mind of the writer the great facts of weather and of climatic control, always, everywhere, were the most interesting study of all.

CONDENSED CLIMATOLOGICAL SUMMARY.

In the following table are given, for the various sections of the Climatological Service of the Weather Bureau, the average temperature and rainfall, the stations reporting the highest and lowest temperatures with dates of occurrence, the stations reporting the greatest and least monthly precipitation, and other data, as indicated by the several headings.

The mean temperatures for each section, the highest and lowest temperatures, the average precipitation, and the greatest and least monthly amounts are found by using all trustworthy records available.

The mean departures from normal temperature and precipitation are based only on records from stations that have 10 or more years of observations. Of course the number of such records is smaller than the total number of stations.

CONDENSED CLIMATOLOGICAL SUMMARY OF TEMPERATURE AND PRECIPITATION BY SECTIONS, DECEMBER, 1912.

Temperature and precipitation by sections, December, 1912.

Section.	Temperature (°F.).							Precipitation (inches and hundredths).					
	Section average.	Departure from the normal.	Monthly extremes.					Section average.	Departure from the normal.	Greatest monthly.		Least monthly.	
			Station.	Highest.	Date.	Station.	Lowest.	Date.			Station.	Amount.	Station.	Amount.
Alabama	47.7	+ 1.1	Troy	82	3	Riverton	14	13	6.51	+ 2.08	Demopolis	11.34	Alaga	2.02
Arizona	40.1	− 3.9	2 stations	80	1	Springerville	−12	23	0.62	− 0.35	Chlarsons Mill	2.18	3 stations	0.00
Arkansas	41.7	− 0.5	England	76	19	Dutton	8	9	2.63	− 1.46	Portland	6.49	Rogers	0.05
California	44.7	− 2.0	King City	89	7	Tamarack	− 6	6	1.58	− 2.45	Weitchpec	15.59	40 stations	0.00
Colorado	21.2	− 3.9	Monument	70	24	Fraser	−34	26†	0.58	− 0.40	Gladstone	2.11	2 stations	0.00
Florida	62.7	+ 4.8	4 stations	86	4†	Garniers	24	28	2.43	− 0.65	Hypoluxo	8.43	....do	0.66
Georgia	49.3	+ 2.4	2 stations	83	7	Gore	18	14	3.50	− 0.67	Marshallville	5.92	Valona	1.36
Hawaii (November)	70.9	.....	Pahala, Hawaii	92	21	Humuula	33	24	6.42	.....	Hakalau	34.36	2 stations	0.00
Idaho	26.6	− 0.5	Lewiston	61	3	Pierson	−22	20†	1.75	− 0.47	Grand Forks	8.45	Garnet	0.15
Illinois	34.1	+ 3.9	6 stations	64	5	Dakota	− 2	12	0.93	− 1.27	Rileyville	2.82	Springfield	0.31
Indiana	34.3	+ 3.2	Vevay	68	5	Auburn	− 2	23	1.41	− 1.42	Scottsburg	3.26	Collegeville	0.24
Iowa	29.2	+ 5.6	Keokuk	64	5	Inwood	−13	6	0.74	− 0.45	Northwood	1.75	2 stations	0.10
Kansas	34.9	+ 2.4	2 stations	70	14	Oketo	− 2	12	0.35	− 0.49	Chanute	1.12	3 stations	0.00
Kentucky	37.2	− 0.7	Scott	73	1	2 stations	5	13	3.98	+ 0.23	Franklin	6.81	Paducah	2.12
Louisiana	51.2	− 0.2	Reserve	90	16	Grand Cane	16	28	12.11	+ 7.36	Donaldsonville	28.03	Plain Dealing	3.04
Maryland-Delaware	38.5	+ 4.0	Emmitsburg, Md	75	7	Oakland, Md	−10	26	3.94	+ 0.49	Sudlersville, Md	5.25	Cumberland, Md	1.81
Michigan	28.6	+ 4.0	Allegan	62	4	Bergland	−14	12	1.62	− 0.66	Calumet	4.74	Plymouth	0.23
Minnesota	20.0	+ 5.0	Pipestone	60	14	2 stations	−25	8†	0.93	+ 0.13	Duluth	2.19	Worthington	0.16
Mississippi	47.1	− 0.6	Waynesboro	79	3	Corinth	18	13	9.44	+ 4.83	Woodville	17.40	Austin	3.87
Missouri	36.5	+ 2.9	Gano	72	5	Grand City	2	12	0.59	− 1.58	Caruthersville	2.36	Sublett	0.00
Montana	28.0	+ 4.5	Heron	66	5	Bowen	−22	25	0.71	− 0.32	Saltese	10.78	Huntley	0.00
Nebraska	30.4	+ 3.6	2 stations	68	11†	2 stations	− 8	6†	0.23	− 0.45	Arden	1.10	6 stations	0.00
Nevada	29.8	− 0.8	Jean	68	23	San Jacinto	−16	22	0.23	− 0.85	Spooners Ranch	1.10	....do	0.00
New England	31.7	+ 5.4	Chestnut Hill, Mass.	76	19	2 stations	−15	13†	4.34	+ 1.07	Hyannis, Mass	7.44	Patten, Me	1.21
New Jersey	36.9	+ 3.7	2 stations	68	6	Layton	− 1	26	4.73	+ 0.90	Dover	6.33	2 stations	3.40
New Mexico	29.4	− 4.0	Bell Ranch	75	3	Virsylvia	−22	22	0.53	− 0.12	Hachita	3.67	3 stations	T.
New York	31.5	+ 6.1	Waverly	67	6	Lake Placid Club	−10	9	2.84	− 0.37	Southampton	7.27	Harkness	0.19
North Carolina	44.5	+ 2.8	Tarboro	80	5	Banners Elk	6	25	2.95	− 1.23	Highlands	7.11	Asheville	0.90
North Dakota	18.9	+ 5.6	Medora	72	3	Willow City	−28	11	0.43	− 0.05	Bottineau	3.13	6 stations	T.
Ohio	33.8	+ 2.9	Thurman	74	10	Bellefontaine	− 5	12	2.26	− 0.54	Milligan	2.26	Napoleon	0.88
Oklahoma	39.2	+ 0.4	Healdton	72	1	Kenton	0	21	0.70	− 0.61	Calvin	1.77	Beaver	0.00
Oregon	35.5	− 0.3	Marshfield	66	8	Seneca	−15	20†	4.83	− 0.37	Happy Home	18.34	Richland	0.38
Pennsylvania	34.4	+ 3.9	Coatesville	71	6	Pocono Lake	− 4	26	3.27	+ 0.06	Pocono Lake	6.48	Center Hall	1.12
Porto Rico	74.7	+ 0.2	Comerio Flats	93	11	Maricao	50	13†	3.92	− 1.63	Rio Grande	19.74	Central Aguirre	0.16
South Carolina	48.8	+ 2.5	3 stations	79	4†	Greenville	18	14	2.88	− 0.48	Beaufort	6.01	Little Mountain	0.90
South Dakota	26.4	+ 5.3	Hermosa	69	13	Roslyn	−18	11	0.30	− 0.35	Dumont	1.75	2 stations	0.00
Tennessee	40.3	+ 0.2	2 stations	71	5†	Mountain City	2	28	5.40	+ 1.20	Waynesboro	8.61	Covington	1.90
Texas	46.3	− 3.9	Bay City	88	5	Dalhart	1	21	2.75	+ 0.78	Mont Belvieu	16.57	Stratford	0.00
Utah	24.3	− 2.6	Emery	66	3	Strawberry Tunnel—East	−32	21	0.47	− 0.51	Thistle	3.80	Hanksville	0.00
Virginia	40.1	+ 3.0	2 stations	77	6	Mountain Lake	− 6	12	2.95	− 0.24	Speers Ferry	5.87	Lebanon	0.59
Washington	35.8	+ 0.6	Kiona	76	3	Snyders Ranch	− 2	21	5.13	− 0.28	Quinlault	25.28	Kennewick	0.29
West Virginia	35.8	+ 2.3	2 stations	76	4†	Marlinton	− 6	25†	2.88	− 0.40	Pickens	5.55	Burlington	1.45
Wisconsin	24.8	+ 5.1	Sheboygan	58	2	Solon Springs	−16	12†	1.81	+ 0.30	Solon Springs	3.20	Oshkosh	0.73
Wyoming	21.4	− 1.3	Eatons Ranch	68	9	Foxpark	−31	22	0.77	− 0.27	Snake River, Y. N. P.	3.11	4 stations	0.00

† Other dates also.

In the above table in the February, 1911, Monthly Weather Review, page 310, the mean temperature departure for Virginia should read + (plus), instead of − (minus) as printed.